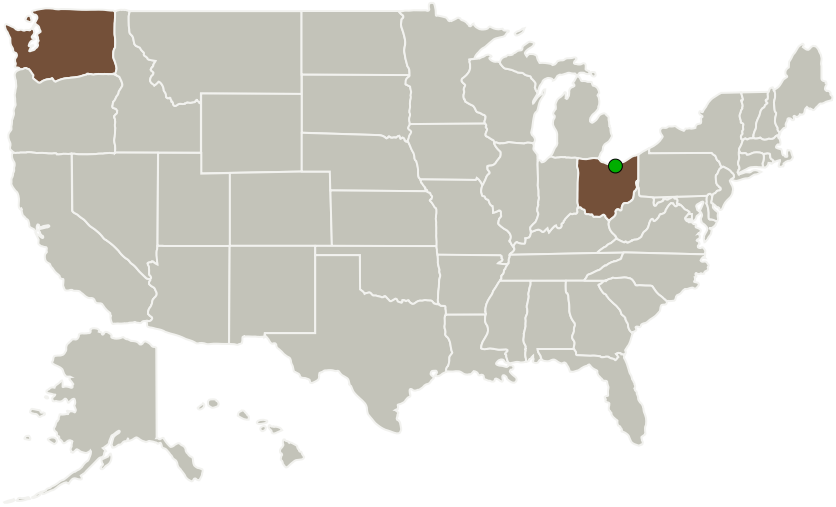
High Performance Plasma Channel Insulators for High Power Hall Thrusters, Phase I

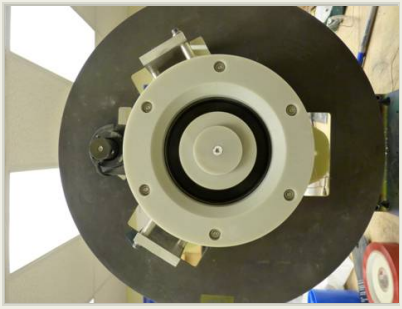
Completed Technology Project (2013 - 2013)

Project Introduction

NASA missions for planetary exploration require high power, long-life Hall thrusters. However, thruster power and lifetime are limited by the erosion of plasma channel walls. Current plasma channel insulator materials, such as BN or Borosil, have the required low secondary electron emission (SEE) but are susceptible to xenon plasma erosion. New plasma channel insulator materials with low SEE yield and high xenon plasma erosion resistance are needed to increase the efficiency and the lifetime of Hall thrusters. AlN has an exceptionally high plasma erosion resistance but suffers from a high SEE yield. AlN can be a "revolutionary" replacement for BN channel insulator since it provides high plasma erosion resistance with structural robustness and high thermal conductivity if it's SEE yield can be reduced. This SBIR Phase I program will develop a revolutionary AlN plasma channel insulator with lower SEE yield and higher erosion resistance than BN and BN-SiO2 for high power, long-life Hall thrusters. In Phase I we will (i) reduce the SEE yield of AlN by microstructural engineering, and (ii) fabricate fully functional plasma channel insulators for thruster testing at NASA-GRC to determine if the reduction of SEE yield of AlN channel insulator leads to better thruster performance than BN channels.

Primary U.S. Work Locations and Key Partners





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Organizations Performing Work	Role	Type	Location
Sienna Technologies, Inc.	Lead Organization	Industry	Woodinville, Washington
Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio

Primary U.S. Work Locations	
Ohio	Washington

Project Transitions

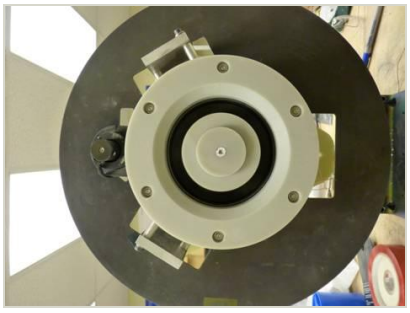
May 2013: Project Start

November 2013: Closed out

Closeout Documentation:

- Final Summary Chart*(https://techport.nasa.gov/file/140453)*

Images



Project Image
High Performance Plasma Channel Insulators for High Power Hall Thrusters
(https://techport.nasa.gov/image/129780)

Organizational Responsibility

Responsible Mission Directorate:
Space Technology Mission Directorate (STMD)

Lead Organization:
Sienna Technologies, Inc.

Responsible Program:
Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:
Jason L Kessler

Program Manager:
Carlos Torrez

Principal Investigator:
Ender Savrun

Co-Investigator:
Ender Savrun

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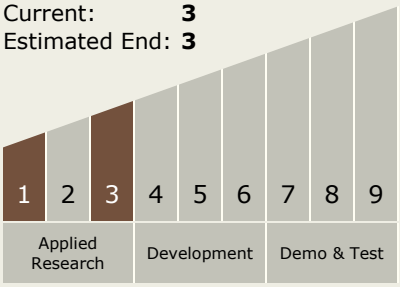
Technology Maturity (TRL)

Start: **1**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.2 Electric Space Propulsion
    - TX01.2.2 Electrostatic

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System